

Intestinal Parasitic Infections in Bahir Dar and Risk Factors for Transmission

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Abstract: A study of intestinal parasites and assessment of transmission factors were made in Bahir Dar town, northwestern Ethiopia. Out of 528 children examined by formol-ether concentration method over 95 % were found to harbour one or more intestinal parasites. Human behaviour and poor sanitary conditions appeared to be responsible for the transmission of geohelminths, faeco-orally transmitted amoebae and water-related schistosome parasites. Health education is suggested to play a vital role in the control of intestinal parasitic infections.

Key words: Parasites, Transmission, Vegetables, Soil, Ethiopia

INTRODUCTION

Intestinal parasites of man are cosmopolitan in distribution, posing more serious health problems in the tropical regions where disease, ignorance and poverty are interlocked. Owing to their ubiquity and high rates of infections in these regions of the world, physicians and public health authorities show little interest in their control (WHO, 1981). Consequently, there is a tendency to view them as part and parcel of life.

Not all of the known human intestinal parasitic infections have properly been estimated. Hence, available prevalence figures in developing countries of the tropics are not reliable. This could either be due to lack of resources to conduct systematic surveys or due to little attention given to them from health workers or researchers. Estimated global infection rates for some helminthic parasites such as *Ascaris*, hookworms and *Trichuris* are 1,000 million, 900 million, and 500 million, respectively (Warren and Mahmoud, 1984). Among intestinal protozoal parasites *Amoeba* and *Giardia* have been estimated to have respective prevalence of 400 million (Walsh, 1986) and 200 million (Warren and Mahmoud, 1984).

According to Shibru Tedla (1986) every person in Ethiopia would have infection by one or more helminthic parasites in his life time. In a nationwide survey comprising 28,696 people, he estimated *S. mansoni*, *A. lumbricoides*, *T. trichiura*, hookworms, and *S. stercoralis* infections at 57 %, 36 %, 10 % and 3 %, respectively. On the other hand, protozoal infections by *E. histolytica* and *G. lamblia* have been estimated at 3 % (Berhanu Erko *et al.*, in press) and 3.1 % (Hailu Birrie and Berhanu Erko, in press), respectively.

This paper presents the species and prevalences of human intestinal parasites in Bahir Dar town and also describes important factors conducive for their transmission. Control measures that seem to be feasible to ameliorate the situation are indicated.

MATERIALS AND METHODS

Study Area and Population

The survey was carried out in the year 1993 in Bahir Dar town, the capital city of Region 3, northwestern Ethiopia. The town is located at 11° 33'N and 37° 24'E. It is a fast growing town with a population of about 90,000.

Bahir Dar town is situated in areas of a tremendous economic interest by virtue of its proximity to a navigable lake, Lake Tana, tourist attracting waterfall, the Tis Abay, the Zeghie monasteries and development projects such as Tana-Beles Irrigation Schemes.

The study subjects were school children from two elementary schools in the town. The schoolchildren were chosen to constitute the study subjects as they are easily accessible and best indicator groups for health surveys representing all socio-economic classes.

Stool Collection and Examination

Twenty percent of the schoolchildren were selected using systematic random sampling from a sampling frame we prepared by collecting and compiling rolls of all grades in the schools. Plastic sheets were handed out to all children included in the sample to procure adequate stool specimens. About 2 gm of the stool specimens were transferred into 10 ml screw-capped vials one third filled with 7.5 % formalin. The preserved specimens were transported to the laboratory of the Institute of Pathobiology where they were qualitatively examined by skilled technicians employing formol-ether concentration method (Ritchie, 1948).

Observation on Human Behaviour and Sanitation

Direct observations were made on the surrounding sanitation, human practices and defecation patterns to identify factors that may be risky for the transmission of intestinal parasites.

Examination of Vegetables Water for Parasites

Vegetables, i.e., cabbage and lettuce, grown in gardens, were purchased from owners to observe whether or not they were contaminated with parasites as a result of being watered with water retained by temporary pockets remaining after receding of the lake water. The vegetables were rooted up and the roots and leaves were taken apart. Leaves picked from cabbages and lettuce were thoroughly washed in 7.5 % formalin. The suspension was then let aside to give time for sedimentation. After discarding the supernatant the sediment was qualitatively examined under the microscope. Water from the temporary pockets which was used to water the vegetable was collected and preserved with the same concentration of formalin and microscopically examined in the same way.

Examination of Moist Soil for Parasites

Top soil samples were taken from different spots at 50 cm interval. From each spot about 3 gm of moist soil sample was taken. All samples were mixed in a glass container of 2

liter capacity containing one liter of 7.5 % formalin. In the laboratory, about 2 gm of the preserved soil samples were suspended in centrifuge tubes which were 1/3 filled with equal volume of distilled water and 7.5 % formalin and was allowed to sediment. The supernatant was discarded and the sediment resuspended as above. Finally, the supernatant was discarded and the sediment was qualitatively examined for parasites.

RESULTS

Results of stool examination are presented in Tables 1–2. Twelve intestinal parasites

Table 1. Prevalence of intestinal parasitic infections in school children

Parasite species	Prevalence (%)
<i>Schistosoma mansoni</i>	16.5
<i>Ascaris lumbricoides</i>	63.1
<i>Trichuris trichiura</i>	45.1
Hookworms	40.0
<i>Strongyloides stercoralis</i>	17.6
<i>Taenia saginata</i>	0.8
<i>Enterobius vermicularis</i>	0.4
<i>Hymenolepis nana</i>	5.1
<i>Entamoeba histolytica</i>	38.4
<i>Giardia lamblia</i>	13.3
<i>Entamoeba coli</i>	22.0
<i>Iodamoeba bütschlii</i>	8.9

Table 2. The association of intestinal parasites (double infections)

	Sm	Al	Tt	Hw	Str	Ts	Ev	Hn	Eh	Gl	Ec
Al	54										
Tt	31	173									
Hw	41	152	88								
Str	18	66	50	50							
Ts	0	3	2	3	1						
Ev	19	0	1	2	0	1					
Hn	1	22	16	16	3	1	0				
Eh	23	122	88	87	29	1	2	7			
Gl	14	37	27	24	3	0	0	2	35		
Ec	23	74	52	58	20	0	1	4	31	17	
Ib	7	27	17	24	5	1	0	1	25	5	19

Legend: Sm : *Schistosoma mansoni*
 Al : *Ascaris lumbricoides*
 Tt : *Trichuris trichiura*
 Hw : Hookworms
 Str : *Strongyloides stercoralis*
 Ts : *Taenia saginata*
 Ev : *Enterobius vermicularis*
 Hn : *Hymenolepis nana*
 Eh : *Entamoeba histolytica*
 Gl : *Giardia lamblia*
 Ec : *Entamoeba coli*
 Ib : *Iodamoeba bütschlii*

were encountered, 8 of which were helminthic and 4 were protozoal parasites. Infection by *A. lumbricoides* is the most prevalent (63.1 %) among human intestinal parasites. Out of 528 children examined only 22 (4.2 %) were free of parasites. Table 2 presents the association of intestinal parasites or double infections. It appears that double infections by *A. lumbricoides* and *T. trichiura* are most common. In view of having similar life cycles, the same is expected of hookworms and *S. stercoralis*, but this was not so. In polyparasitism, infection with three parasites is the most common (29.0 %), followed by infection with 2 parasites (27.5 %), 4 parasites (17.2 %), 5 parasites (6.1 %) and 6 parasites (3.3 %). Triple infection was mainly caused by *A. lumbricoides*, *T. trichiura* and hookworms.

The majority of the residents had pit or pour-flush latrines. The platforms of many latrines, especially of the pit types, were not neat. When this observation was made during the dry season there was a shortage of water in the town and the majority of pourflush latrines were also not functional. Be it for this reason or for convenience, many children and few adults were observed defecating in the fields and street sides, more commonly in the early morning and late afternoon.

Vegetables are grown in plots along the lake shore during the dry season or little rains. These plots were areas of land exposed as the lake water receded. The vegetables were watered with water retained by temporary pockets.

Many people owned vegetable plots and some owners worked in the plots bare-footed. Children accompanying their parents to the vegetable plots defecated in the plots. Vegetable leaves (both cabbage and lettuce) and water from the temporary pockets examined for parasites were found to contain amoebae cysts and *Ascaris* ova. Unidentified rhabditiform larvae were encountered in the soil samples.

DISCUSSION

Out of the twenty two globally important parasites that top the list of parasites of high prevalence in humans (Mata, 1982), 7 were encountered during the present survey. Five of them were helminths while 2 are protozoal parasites. With the presence of infections by all these parasitic species and their interactions with malnutrition (Solomons, 1993) it is very easy to comprehend the chronic ill-health that exists in the community.

The worst of parasitic infection in the study community was that only 22 persons (4.2 %) out of 528 examined were free of intestinal parasites. On the basis of this findings it can safely be said that if 100 children are stool-examined the probability of finding 95 or so children with parasite of one kind or another is considerably high. This is a good indication of poor sanitary conditions prevailing in the community.

Double infection with *A. lumbricoides* and *T. trichiura* was the most common and this is expected in view of the similarities of their mode of transmission (Table 2). The prevalence of hookworms should also have been similar to that of *S. stercoralis* by virtue of having similar life cycle. However, infections by hookworms (40 %) and *S. stercoralis* (17.6 %) are not closely associated in the present findings. Duncan *et al.* (1970) attributed this discrepancy

to destruction of some *S. stercoralis* larvae by the Ritchie technique. In our findings it is not clear whether or not destruction of the larvae by the Ritchie technique could explain lack of significant association between the two helminths. In keeping with WHO report (1981) triple infection was mainly caused by *A. lumbricoides*, *T. trichiura* and hookworms. Gilman *et al.* (1976) reported that *Trichuris* patients were infected with *E. histolytica* more frequently than patients with other intestinal parasites. In the present study *E. histolytica* was more commonly encountered with *A. lumbricoides*. However, considering the similarities in life cycles of *A. lumbricoides* and *T. trichiura* this difference is not considerable. Five and 6 parasites per infected person was the least. This may hint the possible existence of competition among the parasites as their number increases.

For some parasites such as *E. vermicularis* and *T. saginata*, the actual infection rates might be higher than reported here. As far as *E. vermicularis* is concerned eggs are present in faeces in less than 5 % of infected individuals and thus stool examination is not sensitive enough to diagnose all positive cases (Beaver *et al.* 1984). In the case of *T. saginata*, eggs do not always pass in faeces as intact gravid proglottids frequently pass in faeces or sometimes crawl out through anus.

Human behaviour such as open air defecation and cultural practices such as rearing of vegetables in faecally-polluted gardens were all found to be conducive for transmission of geohelminthes (*Ascaris* and the like), faeco-orally transmitted parasites (amoebae and the like) and for schistosomes the transmission of which is water-related.

Consumption of vegetables grown in faecally-polluted gardens is also equally dangerous. Amoebae cysts and *Ascaris* ova that were demonstrated on vegetables and in water and rhabditiform larvae observed in the soil might be originated from direct defecation in the gardens or faeces washed down in flood from street sides or fields during the previous rainy season. The fact that the majority of households possessed latrines, but people not being accustomed to using them points to a key role health education plays in the control of helminthic and protozoal infections. In another word, mere provision of sanitary facilities without raising community's awareness no significant role.

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